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REMARKS

I. Status of claims

Claims 19, 20, 22-31, 37-42, 45-48 are pending in this application.

The sole rejection of these pending claims, is an obviousness rejection based on U.S. patent no. 5,989,021 to Sato et al.

II. Request for reconsideration

Applicant respectfully requests reconsideration of the rejection of all claims as obvious over Sato et al.

a. Independent claim 19 and its depending claims

Claim 19 recites a method for making a crucible that comprises creating an electric arc by means of an electrode arrangement so as to heat a wall section of the quartz glass crucible as the quartz glass crucible is rotated, and creating an additional electric arc heating an additional wall section of the quartz glass crucible by means of at least one additional electrode arrangement. In addition:

1. the electrode arrangements and their respective heating zones are spaced from each other in relation to a periphery of the quartz glass crucible, and
2. the electric arcs are created so as to reduce temperature differentials in the wall sections as the crucible is rotated relative to temperature differentials in a process employing a single electrode arrangement.

This claimed process is a marked improvement over the methods of the prior art. In the prior art, the crucible is produced by rotating it while SiO₂ granulate is melted and coats their inner surfaces. However, in larger crucibles, the duration of each revolution of the crucible is long enough that it allows the granulate to cool more than is desirable on each turn, meaning that the temperature differential of the crucible wall when it leaves the electrode heating area relative to its temperature when it reaches the heating area again, is so great as to result in a reduction in quality. See specification, page 2, lines 14 to 19.

Sato represents a typical method of the prior art, with an attempt to address the problems associated with making larger crucibles, i.e., the cooling of the wall during the longer rotation involved. As was discussed in the present application in the paragraph starting at page 2, line 10, one approach to resolving the cooling problem is to increase the heat output of the electrodes. This produces a problem, however, in that the increased heat creates bubbles and vaporization, reducing the quality of the crucible.

Sato appears to be addressing this problem of bubbles. See Sato, col. 2, line 63 to col. 3, line 10. However, rather than going in the direction of the present invention, of keeping the heat output of the electrode down, but adding another electrode or more, Sato instead teaches away from the present invention, and goes in the completely different direction of eliminating the bubbles formed. This is accomplished by creating a vacuum in the crucible. Sato, col. 4, line 58 to 66. The result is that the gas in the bubbles is drawn out by the vacuum, and the number and size of the bubbles is reduced. See Sato. Col. 5, lines 18 to 20 and col. 6, lines 1 to 7.

Sato therefore teaches only a single electrode for heating granulate in a crucible, and teaches away from creating an additional electric from a second spaced electrode arrangement that reduces temperature differentials, as required by claim 19. Claim 19 therefore clearly distinguishes over Sato et al.

The Examiner has cited *In re Harza*, 274 F.2d 669, 124 U.S.P.Q. 378 (C.C.P.A. 1960), and has argued that claim 19 is a "mere duplication of parts" taken from Sato, and is therefore not patentable. However, this application of *Harza* is clearly inappropriate.

For one thing, as set out above, the Sato reference teaches away from the second electrode and reduced temperature differentials recited in claim 19.

Secondly, claim 19 recites more than a "mere" second electrode arrangement indicated unpatentable in *Harza*, and instead recites the non-obvious spacing of the electrodes and that the electric arcs be created to reduce temperature differentials, an issue ignored by Sato completely.

In arguing that the second electrode arrangement is obvious, the Examiner has asserted that "[i]n the instant case, an additional electric arc is being duplicated for the purpose of providing sufficient heating of the supplied glass powders. Since the two heat sources heating the supplied glass powder, being fused into a crucible by the heat source, would provide a more homogeneous heating of the glass powder and increase the rate at which the glass crucible is made ...". Office action of March 7, 2006, paragraph bridging pages 3 and 4. Spacing of the electrodes is argued to be obvious "in order to avoid a short circuit". Office action, page 4, lines 4 to 10.

That argument, however, is clearly guided by hindsight, which is impermissible to establish obviousness. Sato is completely silent as to homogeneity of heating, the desirability of which is not suggested by the reference. As to the theory that spacing would be applied to prevent a short circuit across the electrodes, Sato does not discuss the circuitry of the electrode 51, 52. Ordinarily, though, it is thought that a short circuit between two electrode arrangements would be avoided by preventing their being simultaneously charged to arc, not by mere separation. The motivations for the modifications of the Sato reference are therefore more borrowed from the present invention than found in a fair reading of the reference.

For the above reasons, reconsiderations and withdrawal of the rejection of claim 19 and its depending claims 20, 22 to 31 and 37 is respectfully requested.

b. Independent claim 38 and its depending claims

Independent claim 38 recites a process that comprises creating electric arcs by means of a plurality of electrode arrangements each heating in a respective heating zone a wall of the quartz glass crucible while the quartz glass crucible is rotated. The heating zones of the electrode arrangements are spaced from each other in relation to a periphery of the quartz glass crucible, and the heating zones of the electrode arrangements are evenly distributed about the periphery of the quartz glass crucible.

This even distribution of the heating zones of the electrode arrangements allows for a more uniform distribution of the temperature differentials around the circumference of the crucible being formed, yielding the benefit of a superior quality crucible.

As discussed above, Sato teaches away from reducing the temperature differentials of a crucible during formation. In addition, spacing of plural electrode arrangements is not suggested in Sato (which has only one electrode, making spacing inapplicable), nor would even spacing of the electrodes around the periphery be a likely choice of a designer to prevent short circuits. The process claimed in claim 38 consequently is not suggested by Sato, and provides a substantial and nonobvious enhancement of more uniform temperatures in the crucible over the Sato method.

Reconsideration of the rejection based on Sato of claim 38, and its depending claims 39 to 42 is therefore respectfully requested.

c. Independent claim 47 and its depending claims

Claim 47 recites a process for producing a quartz glass crucible in which the crucible is rotated, and SiO_2 particulate material is supplied into it while it is being rotated. Electric arcs are created using a plurality of electrode arrangements. Each electrode arrangement heats a wall of the quartz glass crucible in a respective heating zone while the crucible is rotated so as to heat the SiO_2 particulate material pressed against the wall by centrifugal force from the rotation so as to form a glass surface on said wall. The electrode arrangements are located evenly distributed rotatively about the periphery of the quartz glass crucible. The electric arcs are created such that points on the wall are heated at least twice per revolution so as to reduce temperature differences therein.

Sato also does not suggest a method as recited in claim 47.

As discussed above, Sato does not suggest providing for reduced temperature differentials, but rather teaches away from such a reduction of temperature differentials, seeking instead to address the consequences of un-uniform overheating by using a vacuum to reduce bubbles in the crucible.

Sato's single electrode teaching also does not suggest the plurality of evenly distributed electrode arrangements, heating points on the wall at least twice per revolution of the crucible, and that detailed recitation of interrelationship of the electrode arrangements clearly goes well beyond any mere duplication of parts taken from Sato.

Furthermore, the reduced temperature differentials of the method of claim 47 are not suggested by Sato's contrary teaching of vacuum treatment in a single electrode system, and can only be placed in the prior art by use of impermissible hindsight.

Finally, the spacing of the electrode arrangements would not be an obvious measure against short circuits if the electrode of Sato were duplicated.

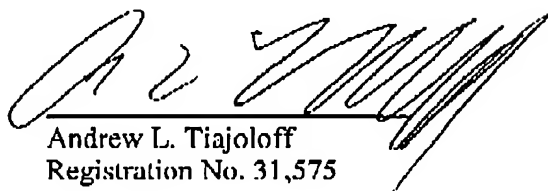
Claim 47 therefore is believed patentable over Sato and the other cited prior art, and allowance thereof is respectfully solicited.

Claim 48 depends from claim 47 and therefore distinguishes therewith over the prior art.

All of the claims herein having been shown to distinguish over the prior art in structure, function and result, formal allowance is respectfully requested.

Should any questions arise, the Examiner is invited to telephone attorney for applicants at 212-490-3285.

Respectfully submitted,



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